



The GNS Science geothermal team is internationally recognised for innovative, robust geoscientific research, expertise and consultancy advice.

Our experienced professionals integrate geology, geophysics, geochemistry and modelling expertise for exploration, drilling advice, environmental sustainability, field development, optimal production and ongoing resource management.

We have supported the global geothermal community for over 50 years, with experience in over 25 countries, including New Zealand, Indonesia, Philippines, Iran, Ethiopia, Madagascar, El Salvador, Turkey, Japan, Papua New Guinea and Chile.



reconnaissance

GNS Science promotes geothermal development through exploration strategies supported by specialist multidisciplinary geoscience interpretation.



FEASIBILITY

Evaluation of existing geoscientific data, resource assessments, expert advice and recommendations for exploration programmes, licensing and permitting.

MAPPING

Field surveys to map geology and structure, and document the distribution and type of geothermal manifestations. The geology and structure of the target area are placed in a regional setting.

FIELD SAMPLING

Sampling (water/gas) and chemical characterisation of surface features and reservoir fluids for interpretation of subsurface temperatures, processes and flow paths.

WATER & GAS ANALYSIS

Analysis of major and trace ion components, as well as stable isotopes.

PETROLOGY

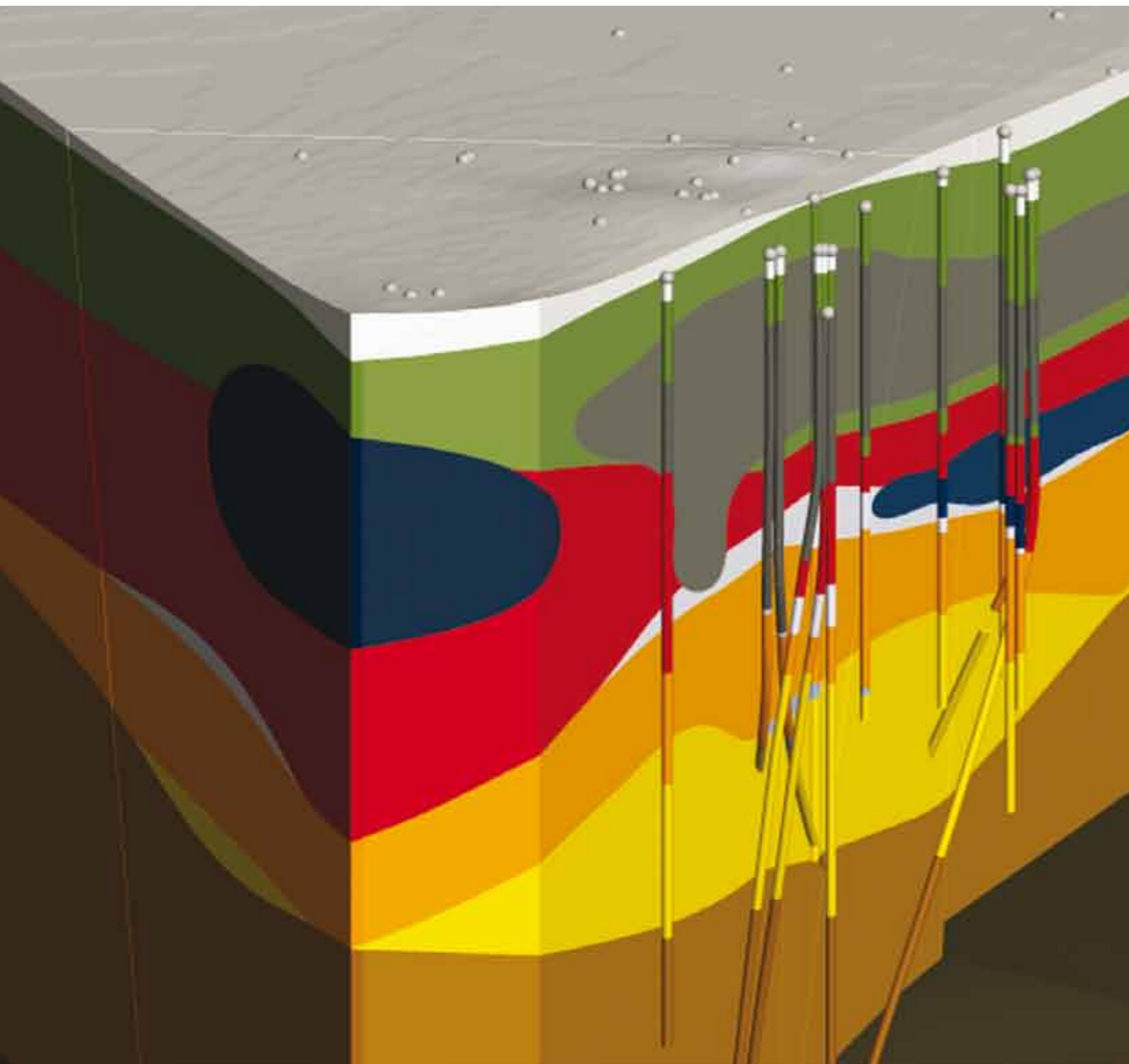
Detailed mineralogical analyses of rocks, drill core and cuttings using optical microscopy, XRD and fluid inclusion analysis. Inferring reservoir temperatures, chemistry, and geohydrological conditions.

CONCEPTUAL MODELLING

Development of conceptual reservoir models, incorporating available geoscientific information.

exploration

GNS Science specialises in the design, execution and data interpretation of exploration programmes, enabling exploration drilling and field delineation to proceed with confidence, reducing risk and cost.



GEOPHYSICAL EXPLORATION

Geophysical methods (MT, seismic, gravity, magnetics) seeking to identify heat sources, and permeability structures. Baseline heat flow assessment. Survey design, data collection, processing and modelling.

RESOURCE ASSESSMENT

Integration of field-wide geological, geochemical and geophysical data to characterise geothermal resources.

WELL TARGETING

Recognising key production targets, controls on reservoir permeability, and potential formation problems. Targeting permeability structures including faults, fractures and stratigraphic formations.

MODELLING

Development of 3D and 4D geological field models; geophysical structural models; and 4D numerical reservoir models.

RESERVOIR GEOCHEMISTRY

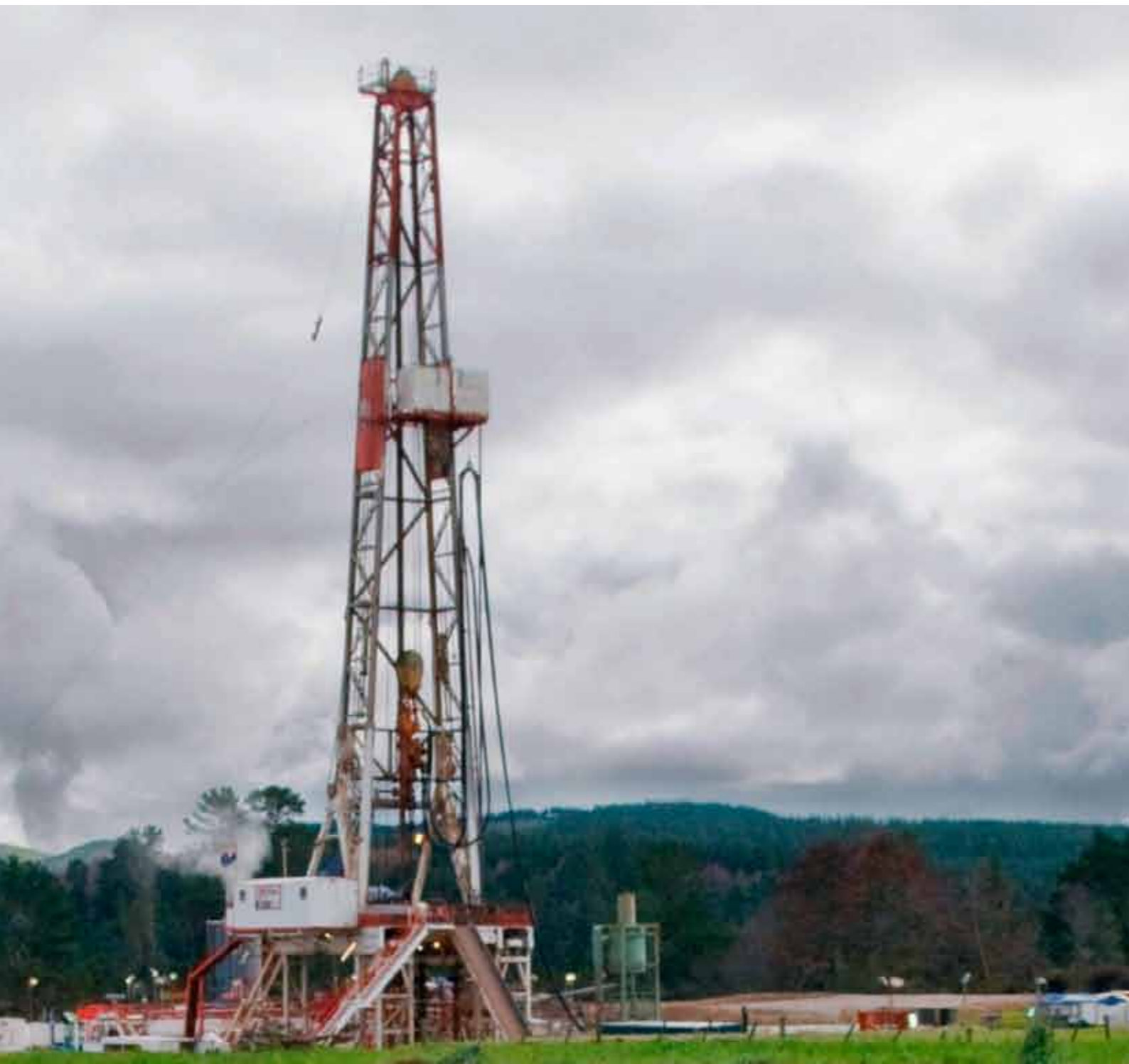
Sampling and evaluation of reservoir fluids to optimise the power generation potential.

ENVIRONMENTAL BASELINES

Pre-commissioning baseline determination and monitoring of microseismicity, ground water, ground deformation and surface thermal features.

development

GNS Science integrates data gathered via geological, geochemical and geophysical techniques to delineate geothermal systems, assess resource capacity, and understand the reservoir chemistry, temperature and hydrology.



RIG GEOLOGY

Advisory services for well drilling, including analysis of drill cuttings, measurements of porosity, clay content and assessment of formation temperatures. Knowledge transfer to mud loggers/ drilling engineers.

3D GEOLOGICAL MODELLING

Leapfrog Geothermal - creating comprehensive models of the field geology, including stratigraphy, structure, rock properties and reservoir parameters.

BOREHOLE IMAGE ANALYSIS

Interpretation and integration of borehole image data with wireline, core and drilling data.

EXPERIMENTAL GEOCHEMISTRY

Laboratory and computer-based simulation studies of scaling and mineral saturation, performing field trials under different design conditions.

POWER STATION DESIGN

Expert advice for design, acquisition and construction of equipment for specialised sampling and analysis, as well as criteria for well, pipeline, power station and condenser design.

RESERVOIR SIMULATION

Simulation of dynamic high temperature conditions using specialist hydrothermal testing apparatus for understanding mineral reactions, water-rock interaction, and to assess tracer suitability.

production

GNS Science supports the long-term utilisation of geothermal energy enabling sustained energy production, improved effectiveness, and mitigation of environmental impacts.



ENVIRONMENT

Design and execution of programmes, including microseismicity, groundwater, ground deformation, and changes to surface thermal features.

PRODUCTION CHEMISTRY

Monitoring of well discharge chemistry to identify changes in reservoir performance. Monitoring and managing corrosion and scaling potential in geothermal pipelines and power plants.

RESOURCE MANAGEMENT

Expert advice to support long-term sustainability. Informing efficient and effective reservoir, field and power station decision-making.

TRACER STUDIES

Radioactive and chemical tracers to locate permeability paths, and methods for quantitative determination of mass flow and chemical fluxes.

MODELLING

Refinement of field, reservoir and regional models to inform decision making.

PEER REVIEW

Independent, expert advice for production and injection strategies, and field management plans.

training

GNS Science provides practical training for the geothermal industry, from introductory to specialist level, building capability and transferring knowledge. Individual or small group training can be delivered in New Zealand and internationally tailored to client requirements.



INTRODUCTION TO GEOTHERMAL EXPLORATION

Introduction to geothermal systems and the process of geothermal exploration, exploration drilling and resource evaluation. Participants gain capability to understand and develop the exploration of geothermal prospects. 3-day short course.

LEAPFROG GEOTHERMAL: 3D GEOLOGICAL MODELLING

Integrated 3D geological modelling and visualisation software for the geothermal industry. Participants can create comprehensive 3D models of field geology, including stratigraphy and structures, rock properties and reservoir parameters. 3-days generic course or 5-day course customised to client data.

GEOTHERMAL BOREHOLE IMAGE INTERPRETATION

Overview of wireline logging, acoustic borehole imaging, geological interpretation and integration with other techniques. Participants will be able to critically assess interpretations, and understand the applications of data from acoustic borehole imaging technology in the geothermal industry. 1-day course.

FIELD TRAINING

Tailored training courses in geological methods, geophysical techniques and chemical sampling. Participants are mentored within our laboratories and in the field so that they gain a clear understanding of, and confidence using, a range of specialist equipment.

CUSTOMISED TRAINING

A specific training programme tailored to suit client needs. Targeted industry training for all stages of geothermal exploration, development and production, including geology, geochemistry, geophysics, and reservoir engineering.

STUDENTSHIPS

Geothermal education and training for undergraduate and postgraduate students. Delivery of short courses, laboratory and field training, as well as internships. Introductory level or specialist subjects.

research

GNS Science leads a collaborative, multidisciplinary research programme supporting environmentally sustainable growth in New Zealand's geothermal resources, including utilisation of the deep (3–7 km) resources and increasing direct heat use applications.



FRACTURE CHARACTERISATION

Characterisation and modelling of fractures in geothermal reservoirs, and water and steam flow in fracture networks, to better understand the role of fracture flow in focusing hydrothermal fluid.

RESOURCE DELINEATION

Application of combined geophysical methods to identify heat sources, areas of possible deep-seated permeability and fluid flow, to understand time-spatial changes, and to identify potential targets for drilling.

FLUID-ROCK INTERACTION

Assessing changes in rock porosity, fracture permeability, well productivity and infrastructure resulting from fluid-rock interactions at high pressures and temperatures, to provide insights into the nature of deep fluids.

MODELLING

Geological, geochemical and geophysical modelling of geothermal systems. 3D and 4D geological field models; geophysical structural models; and 4D numerical reservoir models.

BIODIVERSITY & ECOLOGY

Monitoring, characterising and understanding microbiology, macrobiology, and thermal vegetation and their interactions with the physicochemical environment, to assist in the management of geothermal ecosystems.

SHALLOW GEOPHYSICS

Development and use of shallow geophysical methods and interpretive capability, for improved shallow thermal exploration, resource delineation, subsurface characterisation, and field monitoring.

LONG-TERM SUSTAINABILITY

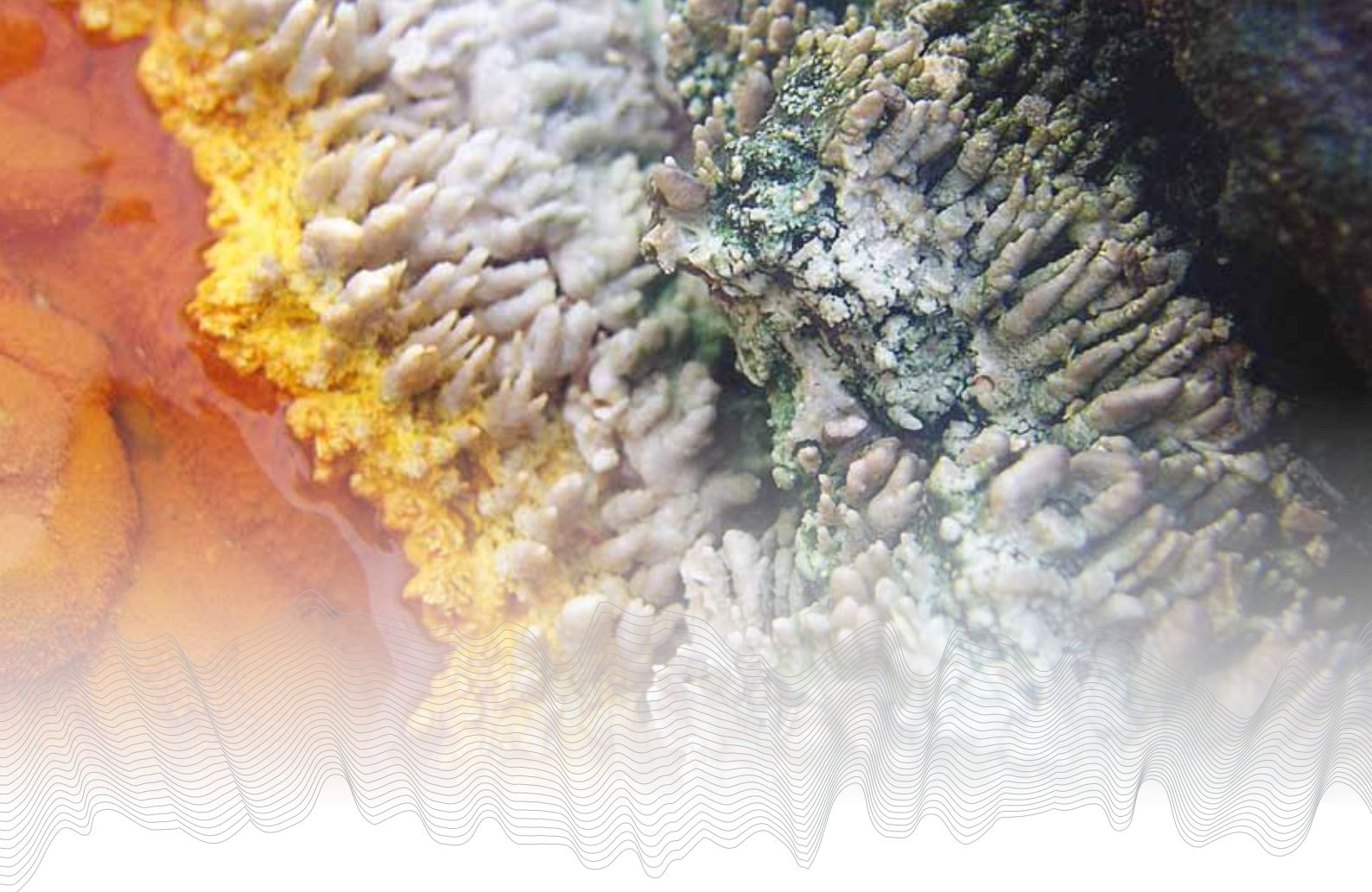
Determination of long-term sustainable production levels and strategies, as well as development of management protocols, communication initiatives and social, economic and policy frameworks, to promote the increased utilisation of geothermal energy.

PRODUCTION CHEMISTRY

Laboratory experiments to derive thermodynamic data on mineral solubilities and metal-transport mechanisms that are site- or situation-dependent, for application in geothermal fluid chemical modelling.

NEW TOOLS & TECHNIQUES

Developing new ideas and innovative capabilities by exploring value-added geothermal mineral and biotechnology applications, developing tools and techniques, and undertaking resource and technology case studies.



Contact us:

Contact us to find out how we can address your unique question, and support the success of your project.

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